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THE INDUSTRIAL BASE

OBJECTIVE

Success in developing and producing defense systems relies heavily on the technological and industrial capability of the defense industry. In managing development and production programs, the program manager needs to specifically assess and understand the capabilities of the industrial base to support the program. The material which follows describes the structure and problems of the industrial base and the avenues available to the program manager to achieve the necessary and available support from that base. Key guidelines to follow are:

1. Determine the capability of the base to supply the types and quantities of material required.
2. Provide industry motivation to compensate for any shortcomings in capability or capacity.
3. Make use of the Defense Priorities and Defense Materials Systems.
4. Assure continuing ability to meet production surge and continuing support demands of the operating forces.

INTRODUCTION

The industrial base is composed of prime contractors, together with tiers of subcontractors, with the plant and equipment and skilled workers necessary to develop and produce the hardware required to fulfill the nation's defense program.

The mission of the Department of Defense is to provide for the common defense of the country. This requires a political and military infrastructure which can provide worldwide influence. The heart of the United States deterrent power is an inventory of military equipment and human resources. The lifeblood of this capability is the United States' industrial base. The "industrial base" combines the manufacturing processes with the managerial talent which establishes a strong economy and industrial sector to produce weapon systems required to provide for the defense of the country.

The U.S. Congress has been focusing attention on the defense industrial base for a number of years. One of the definitive descriptions of the base was a report by the House Armed Services Committee (HASC) on December 31, 1980, titled, "The Ailing Defense Industrial Base: Unready for Crisis." This report described a serious decline in the nation's defense industrial capability. The report cited an alarming erosion of crucial industrial elements, coupled with a mushrooming dependence on foreign sources for critical materials.

A number of problems have degraded the ability of the industrial base to respond to near-term readiness, surge and mobilization requirements in a timely manner. The same problems have resulted in a deterioration of the subcontractor and vendor base which has diminished the likelihood of competition and contributed to the emergence of production bottlenecks.

Our society is changing at an ever-increasing pace due to advances in technology and economic stimulation by foreign competition. America has historically been a leader in technology innovation, application, and productivity. This has provided us the competitive edge necessary to secure a large market share. A substantial loss in commercial market share in recent years has been largely due to United States' failure to acknowledge and prepare for the increasing capabilities of our worldwide competitors.

The market for defense systems and equipment has been relatively shielded, but is now being affected by the increasing reliance on foreign manufacturers for various products that U.S. manufacturers can no longer produce with comparable quality at competitive prices.

Current economic conditions and the uncertain future being projected are compelling reasons for a change in attitude. American industry is awakening to the challenge of foreign competition, but finds itself in a mind-set that is very difficult to change. The industrial revolution and the post-World War II prosperity gave everyone a false sense of security. A sustained demand for American products, supported by a lack of competition in the international markets, induced complacency regarding quality and led to the pursuit of short - term objectives for larger profit margins.

In many cases industry has disregarded the impact of quality technology due to perceived excessive cost. Manufacturers are now being required to radically modify many of the ingrained concepts and adopt new principles based on the new concept that quality cannot be inspected into the end item.

During the past decade, we have witnessed a substantial loss of manufacturing capability as many companies and practically entire industry segments have closed shop. Failure to improve quality, while striving to reduce costs and improve the declining profit margins caused by foreign competition, has often been cited as the problem. Many companies have been driven out of the market due to their inability to recognize their shortcomings and implement fundamental changes throughout their organization. This process has, through the years, caused a significant erosion of our industrial base.

The ability of our military forces to meet our national security objectives is, in large measure, a function of the strength and vitality of U.S. industry. If we characterize the condition of U.S. industry as a percent of the national product, it appears to be expanding. For example, factory capacity is increasing, capital investments are up, and unemployment is at its lowest level in seven years. However, these statistics are misleading because they do not reflect the true status of key defense industries. The DOD is dependent on many highly specialized industries; therefore, we must focus on specific industry segments when we assess the industrial base in relation to national interests.

The DOD has been surveying some industries known to be facing difficulties. We do not know the full extent of the implications of a failure of these highly specialized industries on our ability to preserve the peace or mobilize for war; but we do know that the DOD cannot solve industry's problems. Ultimately, industry's behavior will determine not only its own health, but also the national economy, and the future of the work force. However, DOD cannot be complacent about the national security implications of a declining industrial base. We must, therefore, use the leverage of the DOD procurement budget to help modernize our factories, increase productivity and quality, and provide incentives that will promote technological and manufacturing leadership essential to national security.

INDUSTRIAL BASE ASSESSMENT

The Congress and DOD have both been active recently in defining the status of the industrial base and developing potential solutions.

Senate Activity

On July 23, 1987, the Senate Subcommittee on Defense Industry and Technology of the Committee on Armed Services conducted a hearing on the manufacturing capabilities of key second-tier defense industries. The information presented to the Senate included statements about the health of the optics, bearing and machine tool industries, and a statement from the Defense Advanced Research Projects Agency (DARPA). The subcommittee members received in-depth testimony on the technology base, the industrial base and on the impact of the changes to DOD's acquisition process. The conclusions arrived at by the committee members were that the technology and industrial base were deteriorating; but, more importantly, the root cause of this condition appeared to be in the second and third-tier defense manufacturers. Within the optics industry, foreign manufacturers provide 75% of the optics used by DOD and American manufacturers. The crux of the problem seems to be in the nature of competition between American and foreign manufacturers, which will be discussed later. The recommendations provided to the Senate by the optics industry include the following: require DOD to purchase all precision optical components from domestic sources; provide government support to an industry-wide apprenticeship training program; and provide congressional and DOD funding support for a program aimed at making the U.S. optical manufacturer

more competitive in the world market.

It is readily apparent that the bearing industry plays an important role in all aspects of the country's defense. Current studies indicate that the domestic industry cannot meet mobilization requirements. The import picture for 1986 shows that the U.S. imported 64% of ball bearings, 40% of tapered roller bearings and 17% of other roller bearings. The Anti-Friction Bearing Manufacturers' Association supports an import quota program and DOD has ruled that all its contractors must buy only American-made ball bearings.

The machine tool industry's capability to support a mobilization is not any better than the previous examples. Since 1986 imports have met 49% of the domestic machine tool demand; 25% of the domestic machine tool capacity has been forced from the business or moved off-shore. The National Machine Tool Builders' Association (NMTBA) which supports a continuation of the 1987 Defense Appropriations Act states that, "Fiscal Year 1987 funds cannot be used to purchase, for use in DOD facilities, 23 Federal supply classes of defense-sensitive machine tools from sources other than the United States and Canada." The NMTBA is also a strong supporter for increased use of the IMIP and MANTECH programs.

A DARPA representative's testimony summarized the nature of the competition by concentrating on the Japanese approach to conducting business. First, they use many techniques to achieve rapid commercialization of new technologies facilitated by the Ministry of International Trade and Industry (MITI). The MITI establishes strategic direction, sets up joint ventures, and provides financing and protection in the domestic marketplace. Second, the nature of the Japanese manufacturing enterprise is also important. The Japanese invest heavily in manufacturing research; make extensive use of just-in-time inventory control procedures which reduce work-in-process costs; and maximize the output of the human resource by attracting the best engineers, providing extensive training to the workers and rotating the job assignments for all categories of workers. Finally the Japanese fully subscribe to the "total quality concept". The Japanese belief that quality is designed in, not inspected in, permeates all aspects of business from R&D, design, vendor purchase, and fabrication finally to test. This approach provides the utmost flexibility for conducting business in the world market.

The result of this hearing was the introduction of a bill, SS1892, to strengthen the industrial base. S1892 acknowledges the importance of the industrial base for the defense of the nation: to develop technologically superior defense material rapidly and to produce such material efficiently in cost-effective quantities during peacetime and to expand production capacity rapidly to meet the demands of a national emergency. The bill provides for the maintenance and improvement of the industrial base. It gives management responsibilities to the Undersecretary of Defense for Acquisition to encourage investment in emerging technologies, modernizing production facilities fostering the dedicated participation of private U.S. sources, and discouraging unfair practices by foreign sources.

House Activities

The House conducted several hearings before the Subcommittee on Economic Stabilization of the Committee on Banking, Finance and Urban Affairs during the months of July and September 1987, to develop the new Industrial Base Initiative. The hearings focused on the entire cross-section of industrial base issues including: condition of the defense production and mobilization capability; and the defense supply system for such parts as gears and aircraft parts; finally the hearings centered around DOD's industrial base initiative, which will be discussed later. The hearings concluded that there is a growing dependency on foreign sources for key components and materials required for the manufacture of weapon systems; the dependence threatens the capability of industry to respond to defense production needs in a timely manner; vendors could only sustain a military operation for a few months; the U.S. industrial capability must be strengthened and preserved; and a potential conflict's outcome could depend upon our ability to produce faster than the enemy. The result of the hearings was a bill, H.R.4037, which was to amend the Defense Production Act of 1950. H.R.4037 is designed to revitalize the defense industrial base of the United States. The Act gives the President the authority to: limit the purchase of parts for all existing and new weapons systems to domestic sources; designate critical industries for assistance in facilities modernization; develop domestic capability for material, services or skills; and use loan guarantees, price guarantees or direct loans all in support of the industrial base.

DOD POLICY INITIATIVES

A major portion of the testimony to the House of Representatives from the Assistant Secretary of Defense for Production and Logistics is expanded in a document titled, "Bolstering Defense Industrial Competitiveness," dated July 1988. In the document, the Undersecretary of Defense for Acquisition reported to the Secretary of Defense on a plan to preserve the industrial base and lay the ground-work for any mobilization activity. The underpinnings to this approach are that DOD plays an important role in the marketplace with spending that represents approximately 21% of the manufacturing gross national product and so has the leverage to accomplish the plan. The more pressing portion of the plan, which has been accomplished, includes the establishment of a Deputy Undersecretary of Defense for Production Base and International Technology and a Defense Manufacturing Board (DMB). Initially the Undersecretary will function as the focal point or advocate for the production base; assess the impact of foreign dependency; determine which industry segments should be supported by DOD strategic planning; and develop a DOD technical educational scholarship program. The DMB is chartered to develop a better relationship with industry; recommend enhancements to the Industrial Modernization Incentives Program; and study methods to integrate the manufacture of commercial and military product lines.

Additionally, on 23 March 1987, Mr. E. J. Healey, the Assistant Deputy Minister (Materiel) Department of National Defense Canada, and Mr. R.B. Costello, Assistant Secretary of Defense for Acquisition and Logistics, U.S. Department of Defense, signed the charter for the North American Defense Industrial Base Organization (NADIBO). The Organization officially recognizes the defense industrial base relationship which has existed between the two countries for more than 50 years. The Organization is designed to: promote the U.S. and Canadian Industrial Preparedness Programs; foster cooperation and coordinated Industrial Preparedness Programs; coordinate defense materiel acquisition responsibilities; promote data exchange between countries to improve industrial responsiveness and the effectiveness of the production base analysis; provide guidance with the goal to develop executable programs; and develop policy recommendations.

INDUSTRIAL BASE IMPACTS

The impact of crucial industrial base elements on program success is apparent when one examines lead times, the supplier base, productivity, and industrial preparedness planning. This chapter will not cover each of these subjects in detail; however, the major points presented here should give the reader an understanding of the magnitude of the problem and some of the new initiatives within the DOD to deal with them.

Lead Times

Lead times for defense material and components tend to be volatile. There are various reasons for this situation, such as: imbalances between capacity and demand; competition from commercial suppliers; raw materials not available.

Lead times are severely impacted by capacity limitations. As orders increase beyond existing capacity, the contractor has the option to increase capacity or to add new orders to backlog. For a contractor with a reasonably steady demand and no capacity expansion, increasing backlog increases in lead time. When these lead time increases are communicated to customers, their response to the lead time is to issue orders immediately to ensure material availability. With constant capacity, these new orders must also be added to backlog, which must then be reflected in increased lead time. As this self-fueling process, often called the lead time capacity syndrome, continues, a relatively small increase in demand can result in extremely large increases in lead times. The area of component and material lead time is extremely critical to meeting program schedules and defining long lead and advanced buy requirements. The program office should maintain continuing visibility of the current status of and the forecast changes in lead times.

Supplier Base Reduction

Numerous causes have been linked with the reduction in the defense supplier base. The primary reasons include economic conditions, material shortages, foreign competition, and government regulations. The impact on defense systems programs is fewer companies in the market place, some loss of competition (with all that entails) and a possible increase in lead times. The implications in periods of surge or mobilization are obvious, as numer-

ous defense systems place demands on too few suppliers.

It is of paramount importance that sufficient production capacity exists within the industrial base to produce defense systems according to planned peacetime schedules with sufficient capacity to expand to meet increased requirements or accelerated schedules due to a wartime situation.

Although defense hardware is usually thought of as being produced by only a few large prime contractors, the entire industrial base encompasses a large number of subcontractors and suppliers that may be engaged entirely, or to some extent in government work. The large prime contractors generally have sufficient capacity to meet normal requirements and surplus capacity for wartime surge demand. Crucial to meeting wartime demand are the many tiers of subcontractors. This is especially critical since the DOD depends almost entirely on the private sector for the materials necessary to support wartime operations.

Of the many thousand companies that comprise the defense industrial base, the majority (over 70 percent) are classified as being subcontractors and lower tier suppliers. More than half of all the dollars expended for defense materiel acquisition go to this segment of the industry. This underlying sector of the industrial base has deteriorated drastically since the Vietnam War resulting in bottlenecks for many parts and supplies. Thousands of suppliers dropped out of the defense business entirely, and others are reluctant to expand in fear of future curtailments in defense expenditures. During the defense build up of the 1980's many of these firms returned to the defense base and were joined by many new entries. The emphasis on competition provided motivation for many new suppliers to enter the base. A number of these new and returning firms are questioning the desirability of remaining in the base for a number of reasons. Many small firms find the requirements imposed by the DOD make business unprofitable.

The program manager should regularly evaluate the total industrial structure supporting the program for indications of potential capacity or capability problems. The fact that this very critical portion of the industrial base is deteriorating is a concern of the Department of Defense. DOD Directive 4005.16, "Diminishing Manufacturing Sources and Material Shortages," is a result of this concern and assigns responsibilities within each DOD component for action to be taken when essential manufacturing sources are endangered. Contractual provisions that would serve to alleviate problems that may be encountered by subcontractors should be used whenever possible.

CAPACITY AND INVESTMENT DECISIONS

Capacity can be defined as the maximum rate of productive or conversion capability of an organization's operations. Capacity is normally constrained by physical facilities, available productive equipment, tooling and/or test equipment. The portion of this capacity actually utilized is determined by the demand on the plant for current and known future workload. Firms engaged in the defense industry must be particularly aware of a need for excess capacity because its customer's (military) demands tend to be somewhat unstable over time.

Operational and investment decisions, made by the contractor, which could increase capacity are influenced by return on investment or profit in relation to the risk perceived and the potential return from other opportunities. Since the early 1970's there have been indications that a majority of industrial facilities used to produce weapon systems and materiel have been growing older, and new investment has not been keeping pace with equipment obsolescence or the advances in manufacturing technology which could lead to higher productivity and lower costs. This has led to an industrial bottleneck where certain limited suppliers are taxed to capacity with competing military and civilian orders. Lead times for the items produced at these facilities tend to be extremely volatile and subject to the demand lead time syndrome described above.

Firms engaged in defense related business tend to look for relatively short pay-off periods for investment, thus reducing the risk of financial losses if the long term business outlook proves unfavorable. There is an indication that defense industries are maintaining their profitability by limiting their investments in equipment. In doing so, they continue to use equipment that is aging faster economically than that used in many commercial industries. This practice is likely to result in increasingly labor intensive operations and higher prices for DOD

goods. This problem is discussed in more detail later in this chapter.

The availability of capital together with its cost, exerts a great influence on the defense firm's decision for increased investment. Generally, lending institutions perceive defense contractors as less attractive risks than their commercial counterparts. Whenever capital is scarce, less desirable credit risks have a difficult time in securing outside financing; therefore, defense contractors find it hard to raise money if a capital shortage develops. If they can secure needed financing, it will generally be at a higher rate than that charged to commercially oriented firms.

A DOD Investment Policy Study Group (IPSG) formed in 1976 found that "necessity" (that is, to produce the product to stay in the business), competition, rates of return, cash flow, and perceived risk were the major determinants of investment in defense business. Of these, risk in relation to return and cash flow seemed to be the major factors with respect to the analysis of individual investment projects.

There are several measures that may be taken by the government to encourage needed investment by defense contractors. Among these are multiyear contracting, industrial modernization incentives which are discussed elsewhere in this Guide.

MOBILIZATION CAPABILITY

A factor that is unique to defense plant and equipment requirements is the excess capacity that must be established and maintained in order to provide mobilization capability. The defense industry's ability to rapidly expand its manufacturing operations is an essential part of the overall defense posture.

The following factors should be considered to improve planning for mobilization:

- Planning should be highly selective. Products that would be required and could be supplied should be identified.
- Critical parts and essential manufacturing machinery, rather than just end items must be effectively planned. Planning must be done for the long lead items, the parts for which there are only a few suppliers, or the particular machinery that is already in use on three shifts.
- Critical labor categories must be examined since this could be a large potential problem. Planning must include other demands on this labor, including military reserve requirements.
- More research and development work needs to be sponsored to find substitutes for the many critical materials on which we are presently foreign dependent. Advances in manufacturing technology could aid in alleviating this problem.
- Purchases should be funded of all items which would significantly affect mobilization capability but would not significantly reduce peacetime defense production. An example would be buying long lead time parts one or two years in advance.

Most of the defense industry prime contractors have some excess plant capacity to gear up in the event of mobilization or surge, but the lower tiers, the parts suppliers and subcontractors, represent the bottlenecks in mobilization capability. In developing these plans it is important to remember that different primes may depend on the same subs for "surge."

PRODUCTIVITY

Productivity enhancement is important to both industry and DOD management. In industry, productivity growth leads to lower costs and provides an opportunity for lower priced products and/or higher profits. It also makes possible increased benefits for employees. In DOD, productivity growth helps to ensure that defense system programs will meet cost and schedule targets, thus providing more resources for other defense needs. The produc-

tivity of any industrial firm is a measure of how well the resources in that firm are brought together and used to accomplish a set of results. Productivity isn't just an increase in the volume of shipments, although this is one element. Traditionally, productivity has been defined as the acceptable output per labor hour. Using this definition, we would quickly discover that in a firm with many employees and little automation, productivity depends principally upon human achievement. On the other hand, in a firm where automation predominates, the human contributions to productivity play a lesser role.

Fred G. Steingraber has written a fine summary of how the definition of productivity has changed over the years. This is the way he sees it:

“The definition of productivity has changed considerably over the past fifty years. Back in the 40's and 50's the measurement of productivity focused on output, or the production of as much as possible. In the 60's and 70's quantity was no longer as important as efficiency, or production at the lowest possible cost. Now in the 80's, given the constraints imposed by scarcities, regulations, changes in job skill and cost mix, and greater international competition, the productivity emphasis is on effectiveness. Corporations are increasingly liable for the quality of their products and the services they offer. [Corporations] are considered social entities, not just economic entities. And, as social entities, [they] are held accountable for attitudes toward issues ranging from the environment to the quality of life in the work place and ultimately to the quality of the product delivered. As a result, the definition of productivity as output over input is useless unless we realize that output now includes in addition to product such factors as quality, service, and safety, while the input is government, unions, people, money, technology, information, motivation”

Productivity is more than output over input. It is the relationship of the quantity and quality of products, goods, and services produced to the quantity of resources (personnel, capital facilities, machine tools and equipment, materials and information) required to produce them.

To determine productivity one must ask: First, was the desired result achieved? (the effectiveness question). And, second, what was the quantity of resources consumed to achieve it? (the efficiency question). Effectiveness relates to performance; efficiency, to resource utilization. How well resources are brought together and utilized is indicated by comparing the magnitude/volume of results, usually called the output (effectiveness) with the magnitude/volume of the resources consumed, usually called the input (efficiency). This ratio becomes an index of the definition and a measurement of productivity.

Factors That Influence Productivity

The factors that influence productivity growth are the work force, management, capital investment, and technology.

Work Force

The members of the work force represent an integral part of the productivity picture. This is portrayed in Figure 2-1. Referring to this figure, you can see that each of the three categories — work force, process, and product — is composed of subordinate elements, any one of which can impact productivity growth. Productivity growth occurs when the cumulative effect of the interdependent elements is improved.

The quality of the work force affects productivity. As the quality increases or decreases, the productivity increases or decreases. There has been a decline in the quality of the work force in the United States during the past few years. This decline can be attributed to a rise in the proportion of young and inexperienced workers in the work force and the decrease in the average work effort. Also, the lack of motivation of many young workers has had an adverse effect on productivity.

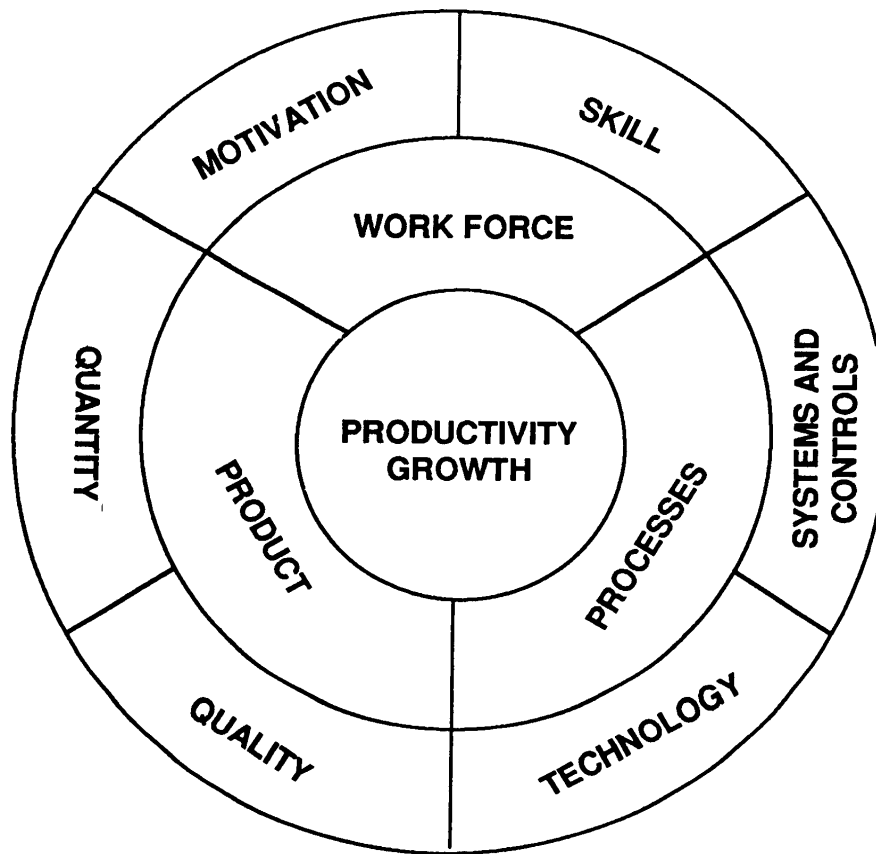


Figure 2-1 Productivity Results from Effective Interaction of the Work Force, the Processes, and the Product

In the Summer, 1981, issue of Productivity newsletter, it was indicated that people — the work force — are the most essential ingredient in any productivity improvement program. The publisher of the newsletter, Norman Bodek, reporting on the results of his survey, stated that the most effective way to bolster productivity is through employee participation programs. Better communications ranks second, followed by improved labor management relations, increased training, improved quality, increased automation, productivity incentive plans, cost reduction programs, and increased research and development.

Management

One of the keys to productivity enhancement within any organization is management. The attitudes, actions, and personal examples of management pervade the organization and affect directly the attitudes, actions and motivation of the work force. It is from management that the workers generally take their cues. Accordingly, astute managers must convey clearly the importance they place on productivity, and their desire to enhance productivity throughout the organization. Unfortunately, actions that management takes to improve productivity in one organization may not work out well when applied to another. Therefore, it is important for managers to assess

the situation within their organization before taking specific actions to enhance productivity.

Capital Investment

Capital investment is necessary if productivity is to be enhanced. Productivity is influenced by the dollars industrial firms are able to set aside for investment in new technology, equipment, and facilities. If the United States is looking for a way to improve productivity, it needs to stimulate capital spending.

Tom Wolfe, contemporary author and social critic, believes that the greatest source of productivity loss in the United States in the 1970's was in the short term orientation of industrial managers. Managers who occupy their positions for short periods of time, either because of job rotation or turnover, are not prone to make long term investment decisions or substantial capital investments. Further, industrial firms have problems in executing long range and consistent company strategies when management changes frequently. Finally, there seems to be a trend away from engineering backgrounds among chief executive officers in the defense industry. Perhaps some of our problems today are the result of the muted voices of engineering and manufacturing executives when key policy decisions are made.

Wolfe bemoans the rise of self-centeredness in our social fabric. Unfortunately, the lack of commitment he has observed in our social fabric has also begun to appear in our industrial fabric. The stockholders in our industrial firms are demanding higher short term earnings. Industrial growth calls for capital investment which reduces short term profits. The management of industrial firms in the United States must make long term commitments to research and development (see Figure 2-2), automating the factory, and corporate growth if productivity is to be enhanced.

New Technology

"Economic growth, technological innovation . . . these are the components of progress. These are the engines that drive our country forward," says Herbert E. Meyer, an editor of Fortune. The enhancement of productivity is not only affected by the results of research and development, but by application and acceptance of new technology. According to Frank Batten, past president of the New York Stock Exchange, "Productivity growth [results from] the application of new technology to the production of goods and services."

A well-managed industrial firm is one in which there is an effective integration of the work force and advanced technology. The genesis of such an organization is an implementation plan that includes education of the work force for factory automation, early identification of new manufacturing processes that will lend themselves to automation, manpower/work load forecasting that takes into account factory automation, and a mechanism for worker feedback.

The Challenge

Productivity enhancement is especially important in the defense systems acquisition business. It is only through enhanced productivity that we can continue to afford defense (weapon) systems in sufficient quantities to deter or counter any foreign threat to our way of life. In the United States we have reached the point at which it has become difficult to sustain the rate of productivity growth we attained in the past. Continuing technological innovation and increased capital investment will help, but they cannot enhance productivity without a work force in tune with the need. The ability, attitude, and action of the people in the work force will have a pronounced effect on the future growth of productivity in this country.

CRITICAL MATERIALS AND COMPONENTS

There is a growing dependence in the defense industry on materials and products from foreign countries. The dependence ranges from relying entirely on imported minerals to using electronic components in our weapons systems that are manufactured abroad.

Strategic and Critical Materials Stockpiling

The Strategic and Critical Materials Stockpiling Act requires that a national defense inventory of strategic and critical materials be acquired and retained to preclude dependence on foreign supply sources in times of

national emergency.

The growth of high technology has altered the various military threat environments faced by deployed forces. Fundamentally, threat environments, weapon systems, the domestic industrial base, and materials used in defense have been in a constant state of change over the past 40 years; the rate of change is increasing. International industrial interdependency has added to the complexity. A national defense stockpile needed 40 years ago when the domestic industrial base was in an expansion mode is different than a stockpile needed today with the base in a diminishing mode.

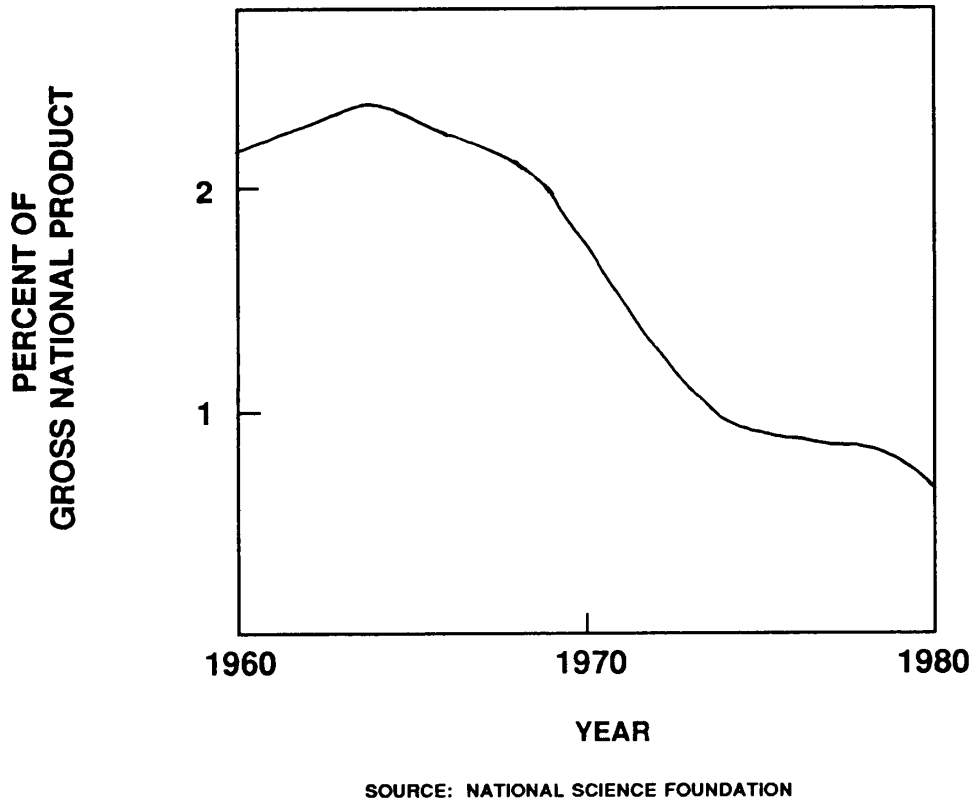


Figure 2-2 Industrial Spending in U.S. for Research and Development

The range of defense industrial need for a national defense stockpile during national emergencies is also different. During World War II and the Korean conflict, the concept of a stockpile was to provide a secure source of industrial raw materials for suppliers to process, so fabricators and subcontractors could provide parts and components needed to manufacture weapon systems and to maintain basic essential industries. Although this concept is still important, the United States is moving away from a basic materials intensive society. Whereas the stockpile was an insurance foundation of fundamental raw materials upon which the industrial base could rely, today's need is increasingly focused on selective applications throughout the various tiers of manufacturing to make up for lost capacities in order to support surge of the weapon and equipment production lines which will exist at the time of national emergency.

The critical materials stockpile is not at established goals. Of the 62 family groups and individual materials that are to be stockpiled, about 60 percent do not meet the goals. The U.S. defense industry has become dependent on foreign sources for materials and components. Japan has taken almost half of the U.S. market for the computer memory chip, and Japan is posing a serious threat to the U.S. semiconductor industry.

Program management offices should perform a study early in the program to identify critical material problems due to uncertain availability or foreign dependency. Contractors should be encouraged to establish material management programs that cover availability, conservation, reclamation, substitution, and the minimal use of critical materials. Increased emphasis should be placed on efforts to improve existing manufacturing processes and introduce new manufacturing technologies that would make more efficient use of critical materials. Defense systems designs that economize on critical materials should be encouraged with incentive awards to contractors.

DOD POLICY ON THE DEFENSE INDUSTRIAL BASE

As stated in the beginning of this chapter, the Department of Defense is responsible for assuring that sufficient industrial capacity exists to meet potential wartime needs for the military services. Executive Order 11490 assigns responsibility to the Department of Defense, in conjunction with industry and other government agencies, for conducting industrial preparedness planning. The Defense Department has issued a number of directives and instructions stating the policy that will be followed and setting forth guidelines and implementing procedures. Pertinent to this purpose are the following:

1. DODD 4005.1, "DOD Industrial Preparedness Production Planning," (a) establishes policy and assigns responsibilities for planning of industrial resources for peacetime, surge and mobilization production of essential military material, (b) issued pursuant to the emergency preparedness responsibilities assigned to the SECDEF under Section 401 of Executive Order 11490 and the production readiness functions as defined in Defense Mobilization Order 11, Maintenance of the Mobilization Base.
2. DODI 4005.3, "Industrial Preparedness Planning." This instruction authorizes: (a) publication of a single DOD Industrial Preparedness Program Planning Manual (DOD 4005.3-M); (b) policy and guidance to identify and prioritize an Industrial Preparedness Planning List (IPPL); (c) preparation of a Production Base Analysis (PBA) report on the existing industrial base; (d) integration of industrial preparedness planning for both surge and mobilization into the production management of defense systems by the responsible program/project and item managers.
3. DODD 4005.16, "Diminishing Manufacturing Sources and Material Shortages." Establishes policies and assigns responsibilities within each DOD component to assure timely action is initiated when essential end item production capabilities are endangered by the loss or impending loss of manufacturing sources or by material shortages.

Other references that deal with industrial preparedness planning are:

1. Executive Order 11490, Assigning Emergency Preparedness Functions to Federal Departments and Agencies, 11 June 1976.
2. Defense Mobilization Order 11 (DMO-II), Maintenance of the Mobilization Base, 1 July 1980.
3. DODD 4275.5, Acquisition and Management of Industrial Resources, 8 October 1980.
4. DODD 5000.1, Major and Non Major Defense Acquisition Programs.
5. DODI 5000.2, Defense Acquisition Program Procedures.
6. DODD 4151.1, Use of Contractor and Government Resources for Maintenance of Material, 20 June 1970.

7. Federal Acquisition Regulation.
8. DODD 4245.1, Defense Production Management.
9. DODI 4400.1, Priorities and Allocations - Delegation of DO and DX Priorities and Allocations Authorities, Rescheduling of Deliveries and Continuance of Related Manuals, 16 November 1971.
10. DODI 4210.4, Studies on the Availability of Materials, 6 October 1971.
11. DOD Manual 4005.3-M, Industrial Preparedness Planning Manual.

The objectives below have been established to improve industrial base capability and responsiveness:

1. Develop an industrial base capability to produce and deliver the five-year peacetime procurement program efficiently, effectively and as quickly as possible.
2. Develop an industrial base capability which will provide surge responsiveness.
3. Develop an industrial base capability which will permit accelerating the attainment of programmed sustainability for selected critical systems or items.
4. Increase industrial preparedness planning funding levels and integrate industrial preparedness resource requirements into the Planning, Programming and Budgeting System (PPBS).

Basic Concept

Mobilization involves preparing for war or other emergencies through assembling and organizing national resources; and the process by which the Military Services, or part of them, are brought to a state of readiness for war or other national emergency. This includes activating all or part of the Reserve components, as well as assembling and organizing personnel, supplies, and material.

The industrial preparedness program is a coordinated system of plans, actions and measures for the transformation of the industrial base, both government-owned and civilian-owned, from its peacetime activity to the emergency program necessary to support the national military objectives. It includes industrial preparedness measures such as modernization, expansion and preservation of industrial facilities. Industrial preparedness focuses on two major areas of industrial base capability, mobilization and surge. Mobilization involves preparing for war or other emergencies through assembling or organizing national resources to focus those resources on bringing the Armed Forces to the required state of readiness and providing the resources to sustain Armed Forces operations. Surge is the accelerated production, maintenance and repair of selected items, and the expansion of logistics support services to meet contingencies short of a declared national emergency utilizing existing facilities and equipment. Only existing peacetime program priorities will be assumed available to obtain materials, components and other industrial resources necessary to support accelerated program requirements.

The foundation of mobilization preparedness planning is the realistic determination of the total production requirements necessary to support the approved forces post-mobilization day (M-day). Surge, on the other hand, is not planned on a given scenario but on the ability to accelerate production of needed items to satisfy various contingencies, using peacetime priorities and allocations authorities and existing facilities and equipment.

D to P Concept

Mobilization planning is based on the "D to P" concept. This is a logistics planning concept by which the gross material readiness requirement in support of approved forces at planned wartime rates (for conflicts of indefinite duration) will be satisfied by a balanced mix of assets on hand on D-day (the day on which operations commence) and assets to be gained from post D-day production through P-day when the planned rate of production deliveries to the users equals the wartime rate of expenditure. The expansion of production occurs through a

mobilization effort (initiated at M-day). D-day and M-day may or may not occur simultaneously. The demands for consumption are established based upon the operational scenario. These demands are translated by the Joint Chiefs of Staff into a Composite Commander in Chief's Critical Items/Weapon Systems List (CINC's List) and furnished to the DOD components for consideration in developing the service Critical Item List (CIL). The CIL is used to develop the Industrial Preparedness Planning List (IPPL). This list shows the weapons systems and components selected by the military departments and the Defense Logistics Agency for industrial preparedness planning. Once items on the IPPL are specified, any of a number of methods may be used for planning including:

1. Preparation of Industrial Preparedness Production Planning Schedule (DD Form 1519).
2. Data Item Description (DID) for Industrial Preparedness Planning (this is especially appropriate for new acquisitions).
3. Direct Industrial Base Planning (without Armed Services Production Planning Officer (ASPPO) involvement).
4. Special Studies.

These approaches are described in detail in the Industrial Preparedness Planning Program Manual, DOD 4005.3-M.

Surge Capabilities

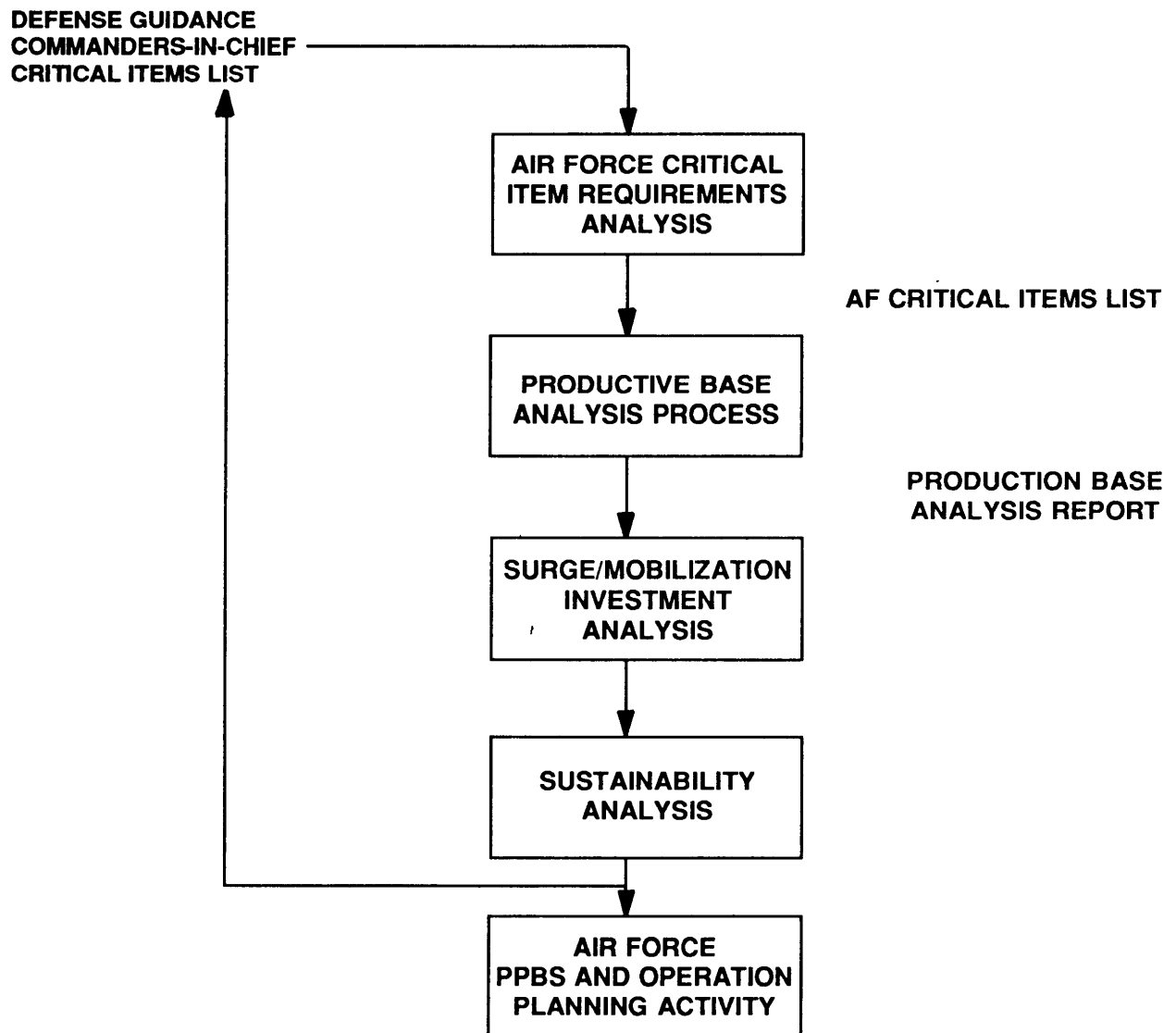
During 1983, a simulation of industrial responsiveness was accomplished under the auspices of the American Defense Preparedness Association and the National Security Industrial Association. The simulation, requested by the Deputy Secretary of Defense, had as its objective the development of a set of recommendations for potential government and industry actions, which would, if instituted, provide a capability to increase production of critical end items (surge) in a national security emergency situation short of full mobilization. At the completion of the simulation, the following conclusions were reached:

1. Production capacity for significantly expanded output can be made available at the prime level at a reasonable cost subject to these conditions:
 - a. Findings may be transitory as a function of economic developments.
 - b. A number of second and third tier suppliers could become choke points.
 - c. Continued comfortable reliance on offshore capability for low cost labor processing, some unique products and coproduction could lead to major disruptions.
 - d. Commercial production develops and supports capability for expanded military output.
 - e. Critical materials, if not stockpiled and supplied as required, could become production stoppers.
2. The major output drivers are the basic availability of production capacity, i.e., production and test equipment, manpower, material, energy, etc. at the prime and subtier level. Waivers and deviations contribute to accelerated production and, in specific instances, perpetuate major bottlenecks if not granted.
3. Preparatory funding, assumed for the simulation, is a real need to build subcontractor capability and to support increased demand for subcontractor and prime working capital.

Additional specific problems in reaching surge objectives were identified in a year-long study by about 60 aerospace companies. The study determined that shortfalls in the U.S. aeronautical space industry hamper airframe and engine manufacturers' ability to surge production to meet emergency requirements and could seriously hurt U.S. defense capabilities. The study showed that while there is some surge capability among airframe and engine producers, production at surge levels cannot be sustained for more than a few months at best.

THE INDUSTRIAL BASE PLANNING PROCESS

The process is really twofold; first, the program manager is required to plan for surge and mobilization, which will be discussed later. The Military Services, along with DLA, are required to assess the capabilities base to meet surge and mobilization requirements and determine where essential military items can be obtained to satisfy surge and mobilization requirements. To accomplish the planning the services are required to develop an annual Production Base Analysis (PBA). The combined PBA of the services measures industry's capability to meet defense requirements and assesses the condition of the industrial base. The PBA evaluates current and planned plant capacity and the potential competing demands between military and commercial requirements during emergencies. During this annual process the Secretary of Defense provides the services with "Defense Guidance", which outlines the latest scenario upon which to plan for an industrial base program. Also, each year the Commanders of the Unified and Specified Commands provide a single list of critical weapon systems and components or critical items list (CINC's CIL) to the industrial base planners. The services then develop their own list of critical weapon systems which is analyzed to determine which components, spares and production capacity are required to support the CINC's CIL. As an example the Air Force's data flow is outlined in Figure 2-3. The process quantifies production for surge and mobilization; identifies IPMs; provides feedback to the operation planners; and develops peacetime investment options for the PPBS and an emergency budget.



Source: Draft AF Industrial Base Program Planning Manual, 19 July 1988

Figure 2-3 Air Force Data Flow for Production Base Analysis

Industrial Preparedness Measures

The analysis of industrial capability provides the basis for estimating the ability of the production base to meet specified production requirements as well as the facility's maximum capabilities to provide a certain item or items. They also suggest what types of actions could be taken to enhance a firm's ability to respond to demand for needed products. These actions are called Industrial Preparedness Measures (IPMs). These IPMs may include such actions as:

1. Modernizing or expanding facilities.
2. Developing improved production techniques.
3. Awarding "pilot line" contracts.
4. Establishing or maintaining stand-by production lines.
5. Maintaining a warm production base.
6. Acquiring and maintaining plant equipment packages with all the necessary special tools, dies, fixtures and special test equipment.
7. Establishing and maintaining multiple production sources.
8. Prestocking raw materials, semifinished materials, components and assemblies.
9. Multiyear contracting.
10. Establishing programs to increase the retention of personnel with key technical skills.
11. Exercising guarantee authority of the FAR and Defense Production Act.
12. Recommending design changes or waivers.
13. Underwriting the establishment/maintenance of U.S. production sources for critical defense material when no current U.S. source exists.
14. Conducting special studies.

One of the more significant recent DOD initiatives to improve industrial preparedness involves the integration of planning responsibilities for current systems into the program management and procurement functions of the services. This change will require program managers and procurement officers to consider industrial preparedness from system development through production/deployment and will be part of the DAB approval process. Planning for critical systems, equipment, and components may be funded as a separate line item in procurement contracts (including appropriate Data Item Descriptions).

The program manager is required to include mobilization capability in acquisition planning. This requirement was included in the Defense Programming and Planning Guidance and in the Planning and Programming Guidance Memorandum for FY 1982. DOD Directive 4005.1, Instruction 4005.3, and Manual 4005.3-M emphasize this responsibility.

The responsibility for IPP has recently been added to the program manager's charter. The PM must:

1. Provide contractors with information concerning required mobilization capabilities.
2. Plan for funds for the creation of any required surge or mobilization capacity.

3. Evaluate the contractor's mobilization plans.

The provisions for attaining the required mobilization levels should be described in the production plan with specific attention to the issues identified in 1983 Industrial Responsiveness Simulation. Also, the impact of the requirement on facility needs should be described. As a program nears completion of the production phase, IPP requirements should again be considered as part of the decision process involved in the disposition of the special tooling and special test equipment.

GRADUATED MOBILIZATION RESPONSE

The latest thinking from OSD is in the area of Graduated Mobilization Response (GMR), as a technique to better fit-up industrial base planning to potential hostile acts on the part of an aggressor. In January 1988, GMR was defined as, "An interagency coordinating system and process for integrating ambiguous and specific warnings with appropriate resource action to: mitigate the impact of, improve responsiveness to, and/or recover from a national security emergency or other crisis." The GMR system provides a framework for mobilization planning across a range of conditions from peacetime to total mobilization. The concept is a system which triggers the response of the industrial base in much the same manner that the DEFCON system triggers the military service and National Security Command in event of an emergency. GMR allows for reaction to all aspects of emergencies from acts of aggression on the part of a belligerent to a natural disaster. GMR has three stages which are further defined into seven levels as shown in Figure 2-4. An important aspect of this system is the increasing control exercised by senior officials.

GMR STAGE 3	GMR STAGE 2			GMR STAGE 1	
PLANNING AND PREPARATION	CRISIS MANAGEMENT			NATIONAL EMERGENCY/WAR	
level 6	5	4	3	2	1
deliberate planning and investment	crisis planning, preparations, and actions			mobilization of the economy	
	(pattern of threat to US id'ed)			(direct challenge to US security)	
Independent actions and info exchange	progressively more coord and NSC direction			NSC or other centralized control	

Figure 2-4 Graduated Mobilization Response

DEFENSE PRIORITIES SYSTEM AND DEFENSE MATERIALS SYSTEM

Description

The Defense Priorities System (DPS) and the Defense Materials System (DMS), promulgated under authority of the Defense Production Act of 1950 (DPA) as amended, are designed to accomplish two main purposes. First, the systems help ensure that national programs are maintained on schedule by providing priority

treatment for the purchase of products and materials by government agencies, contractors, subcontractors and their suppliers. This is accomplished by directing the flow of materials and products to the nation's military, atomic energy, space, and domestic energy production or construction programs. These programs are referred to as "claimant agency" programs. Second, the operation of the systems results in the maintenance of an administrative means by which the total industrial resources of the country could be mobilized should the need arise.

The Defense Priorities System and the Defense Materials System provide the means for exercising the priority and allocation authorities of the President for the purpose of promoting the national defense. They also provide a system which can be promptly expanded to direct the industrial economy of the country to meet the exigencies of war, or other programs designated by law and a Presidential finding as being essential to national security and to maximize domestic energy supplies.

Defense Production Act and Associated Executive Orders

Under Title 1 of the Defense Production Act of 1950, as amended, the President is authorized to establish priorities in the performance of contracts or orders for the purpose of assuring contract performance. He is also authorized, under the same authority, to allocate materials and facilities for the purpose of promoting the national defense. The term "national defense" is defined in the Defense Production Act as ". . . Programs for military and atomic energy production or construction, military assistance to any foreign nation, stockpiling, space, and directly related activity."

Executive Order 11912. Executive Order 11912 delegates to the administrator of General Services authority to use the priorities and allocations authority of the DPA to maximize domestic energy supplies.

Executive Order 12148. Executive Order 12148 delegates to the Federal Emergency Management Agency, General Services Administration (FEMA/GSA) overall authority for the supervision and coordination of the emergency planning activities of the Federal Departments and Agencies. It also makes FEMA responsible for assessments of the nation's industrial capability to support military and essential civilian emergency requirements.

In accordance with this Executive Order, specific authority for the various functions of Title 1 of the DPA has been redelegated as follows:

1. The Secretary of Energy with respect to petroleum, gas, solid fuel and electric power;
2. The Secretary of Agriculture with respect to food and the domestic distribution of farm equipment and commercial fertilizer;
3. The commissioner of the Interstate Commerce Commission with respect to certain limited, domestic transportation functions; and
4. The Secretary of Commerce with respect to all other materials and facilities.

Implementation of functions under Title 1 of the DPA has been assigned by the Secretary of Commerce to the Domestic and International Business Administration (DIBA). The administration of these powers with respect to industrial production and allocations of designated materials is accomplished through a series of regulations and orders called the Defense Materials System and the Defense Priorities System.

Rated Orders Under Defense Priorities System

The rules relating to the status, placement, acceptance, and treatment of priority rated contracts and orders are contained in Defense Priorities System Reg. 1. There are two types of priority ratings: DO ratings and DX ratings. A complete priority rating consists of either one or the other of these ratings symbols and the appropriate program identification symbol (e.g., DO-A1 or DX-A3).

All DO ratings have equal preferential status and take priority over all unrated orders. The program identification symbol which is part of the rating does not affect the preferential status of the rating, that is, the

rating DO-A1 has the same preferential status as the rating DO-E2. All DX rated orders have equal preferential status and take priority over all DO rated orders and unrated orders.

Between rated orders of equal preferential status, priority is given to the order which was received on the earlier date. If there is a conflict between orders of equal preferential status received on the same date, preference must be given to the order which has the earliest required delivery date.

Assignment of Priorities to Rated Contracts

The Defense Priorities System and the Defense Materials System require that any contractor or supplier who receives a DO or DX rated contract or order must use the assigned priority rating in obtaining products, materials, or services needed to complete production, construction and research and development projects for such programs. Properly identified rated orders are called “mandatory acceptance orders” because they must be accepted and given preferential delivery over nonrated orders.

Priorities are assigned to prime contracts by Claimant Agencies. The Department of Defense initiates the use of ratings by assigning them to prime contracts or purchase orders for defense related items. The prime contractors to whom the priority ratings are assigned must place these rating symbols on the subcontracts and purchase orders which they place to complete their rated contracts. Subcontractors and suppliers who accept priority rated orders from their customers must use the ratings they receive to obtain products, components, and materials to fill such rated orders.

Requirements, Set-Asides and Allotments

Requirements for controlled materials are submitted to the Federal Emergency Management Agency, General Services Administration (FEMA/GSA) on a quarterly basis by the Claimant Agencies (DOD, ERDA, DIBA and DOE). The FEMA/GSA uses the requirements submissions to make program determinations as to the amount of controlled materials needed for each Claimant Agency program. For these determinations the FEMA allots appropriate quantities of each of the controlled materials to the Claimant Agencies. The allotments constitute an authorization to the Claimant Agencies to use the specified quantities of controlled materials in the accomplishment of approved programs. The Department of Defense makes allotments of appropriate quantities to the several military departments and subclaimant agencies.

Allotments are issued to Claimant Agencies in terms of the following breakdown of controlled materials:

1. Carbon steel (including wrought iron).
2. Alloy steel (except stainless steel).
3. Stainless steel.
4. Copper and copper-base alloy brass mill products.
5. Copper wire mill products.
6. Copper and copper-base alloy foundry products and powder.
7. Aluminum.
8. Nickel alloys.

The “set-aside” is one of the techniques developed under DMS/DPS to assure the availability of an adequate supply of resources for the fulfillment of authorized programmed requirements. Producers are required to reserve space on their order books for the acceptance of ACM orders in the case of controlled materials and rated orders for other materials or products, up to a specified percentage of their production. The reserve percentage on the order books is held open only during specified lead times after which ACM orders or rated orders may be

rejected. However, DX orders must be accepted irrespective of lead time and whether or not the reserve percentage has been reached.

Requests for Special Assistance

Usually, mandatory acceptance orders are accepted and the products and materials called for thereunder are provided to meet the required delivery dates. There are, however, occasions when the regular procedures provided by DPS and DMS are not sufficiently effective in enabling contractors to fulfill rated contracts on schedule.

When a contractor finds that the delivery promised by a supplier will not support the contract delivery schedule, or if he is unable to obtain acceptance of orders for products or materials required to perform the contract, he shall request assistance from the appropriate Claimant Agency, generally through the procuring organization, often through the program office.

Request for assistance must establish that:

1. There is an urgent need for the products, materials or services covered by the mandatory acceptance order.
2. The contractor has exercised reasonable effort to resolve the problem through employment of his own resources.
3. The request for assistance is timely.
4. The request is not seeking to: (a) Force the solution of purely technical problems, (b) Press for price advantage, (c) Force the resolution of contractual problems, (d) Force unnecessary acceleration of delivery dates, (e) Secure performance beyond the reasonable capability of the supplier, (f) Force acceptance of superior terms and conditions of sale.

Each level of the contractual chain is expected to employ its full resources in attempting to resolve the problem before passing the assistance request to the next higher level. If the Claimant Agency to whom the request may be sent is unable to overcome the difficulty, the request is forwarded to the Office of Industrial Mobilization (OIM) in the Department of Commerce for appropriate action.

OIM officials will attempt to expedite the deliveries, correct any bottleneck, or have the order accepted, by negotiating directly with the supplier or perhaps by locating other sources of supply. OIM provides special assistance in such cases using either formal or informal administrative methods.

A directive issued by OIM takes precedence over all mandatory acceptance orders depending on the terms of the directive. For this reason it is a particularly useful formal tool in eliminating bottlenecks and expediting orders. A contractor must accept and comply with each directive issued. Directives usually require a contractor to take some specific action as defined in the directive itself. Directives take precedence over all rated orders both (DO and DX) as well as over unrated orders. Directives, unlike priority ratings, are not extendible to the lower tiers in the production chain.